Use of a Pile Driver Shroud to Minimize Disturbance to Wildlife

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What is a Noise Shroud?

Above-water Marine Construction Noise Can Affect ESA Listed Species

Bald Eagle

- Federally listed as “threatened”
- Nests in mature trees
- Prevalent along marine shorelines
- Communal roosts
- Present year round

Above-water Marine Construction Noise Can Affect ESA Listed Species

Marbled Murrelet

- Robin-sized seabird
- Federally listed as "Threatened"
- Nests in mature forests
- Forages in marine waters
- Present year-round

Photo by Aaron Barna

Sensitivity to Sound

- Birds have relatively simple ear structure
- Hearing is similar to humans (some exceptions)
- Sounds above 130 dBA cause pain/sickness

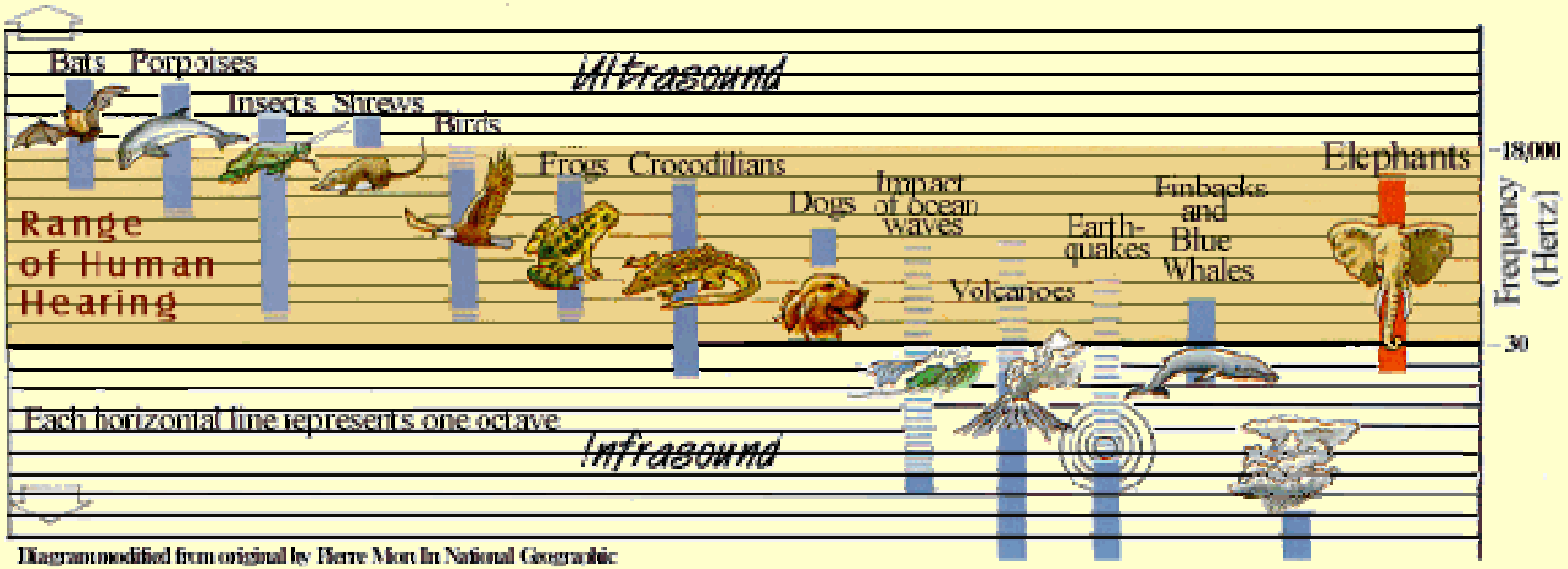


Diagram modified from original by Bruce Mont in National Geographic

Source: http://people.eku.edu/ritchisong/birdbrain2.html

Noise Disturbance Can Result In:

- Nest abandonment
- Egg mortality
- Premature fledging
- Predation
- Depressed feeding rates
- Habitat avoidance


Photo by USFWS


Photo by Aaron Barna

Evaluation of Potential Impacts

- Predict noise levels
  - Source level
  - Transmission loss (attenuation)
- Evaluate exposure
  - Species presence
  - Timing
- Determine risk
  - Life history, status, biological factors
- Manage risk
  - Terms and conditions
  - Conservation measures

Noise Characteristics (Considerations)

- Ambient sound levels
- Type of equipment
  - Pile driving and blasting (one-mile)
- Topography
- Vegetation (hard site vs. soft site)
- Rate of Onset
- Proximity

Evaluating Potential Impacts

Example:

Hood Canal Floating Bridge Replacement (Graving Dock)

Assumptions:

- 135 days of pile driving
- Impact pile driving = Sound Level of 110 dBA at 50 feet
- Transmission loss = 6 dB loss per doubling of distance
- Expected noise level of 86 dBA at nest
- Bald eagle and murrelet “harassment” = >82 dBA
- Pile driving in late nesting season (2003) and early nesting season (2004)

Hood Canal Bridge Graving Dock

Active Bald Eagle Nest

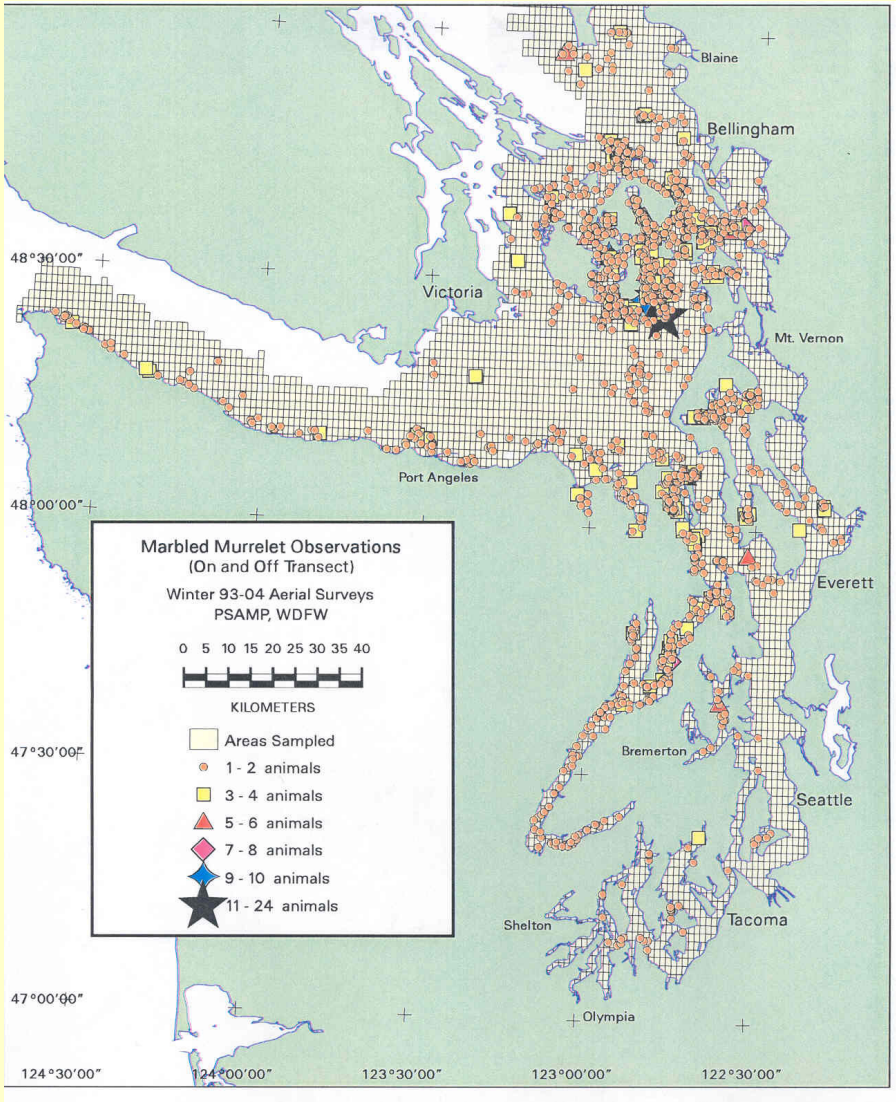
- Nest within ¼ mile and in line-of-site
- 2003 was first year of activity
- Incubation in February
- Fledged 2 young

Biological Considerations

- New nest site
  - May be more sensitive
- Shielding vegetation
  - Deciduous
- Ambient noise
  - Constant
  - Mill whistle
- Urbanized setting
  - Eagles likely tolerant
- Murrelets possible in harbor

Marbled Murrelet Presence

- Project area unsurveyed
- Boat surveys nearby
- Aerial surveys indicated use in vicinity
- Anecdotal reports



Terms and Conditions

To minimize potential harm and harassment of nesting bald eagles and foraging murrelets:

- A noise shroud or similar device will be utilized to reduce noise associated with pile driving throughout the action area.

Noise Shroud

- 2-inch thick sound absorbing material
- Backed by vinyl tarp
- Hung from leads
- Each side was 4-feet wide by 25-feet long

But is a Noise Shroud Feasible?

Question	***Florida***	***Hood Canal Bridge***
Durability	Industrial grade can be re-used	Cannot be re-used
Materials Cost	~$25,000	~$8,000
Operation	- 3-sided OK; - clear fourth side problematic	- 3-sided, positioning an issue
Effectiveness	Reduced SPLs by 8-16 dBA	-Unknown

Outcome and Lessons

- Shroud reduced noise levels
- Shroud did not interfere with operations
- Lost opportunity to evaluate effectiveness
- Monitoring needs to be done based on an established protocol
- 2003 and 2004 – 1 fledgling
- 2005 – 2 fledglings